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BLACK SPOT OF ROSES

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The black spot disease of roses has been reported from many portions of the United States and Europe, and probably occurs wherever roses are grown. The disease is widespread in Florida, and only the most diligently guarded plantings may be expected to escape injury. Although damage due to black spot varies, the disease is tenacious, and under favorable conditions becomes very destructive. Teas, Hybrid Teas, and Hybrid Perpetuals differ greatly in resistance to the disease, although all bush roses are more or less susceptible. Multiflora and Wichuraiana types, as well as Rugosa Hybrids and Moss roses are said to be attacked rarely.

CAUSE

Black spot is caused by a parasitic fungus*, and like most disease-causing organisms, this fungus is microscopic in size. In its development on the rose leaf it manifests two stages, an active summer spore stage and an inactive winter spore stage. It is the summer spore stage which spreads the disease from leaf to leaf and from plant to plant during the growing season and causes defoliation. Temperatures permitting, this stage of the fungus persists throughout the entire year. The winter spore stage develops in dead infected leaves which have fallen to the ground, and with the return of warm temperatures serves to reintroduce the disease.

SYMPTOMS

The disease is recognized by the presence of black spots on the leaves, and by premature yellowing and defoliation. The spots are more or less circular, becoming one-half inch or more in diameter or by coalescing may cover most of the leaf surface, are black in color, have irregularly fringed margins, and appear on the upper surface of the leaves as well as on the leaf petioles. The fringed or fibrillose border of the spots is due to the presence of radiating strands of fungous growth immediately beneath the leaf cuticle. The leaf tissue surrounding the spots usually turns yellow, although during moist weather following severe infection the leaves of entire plants may drop before yellowing occurs.

CONTROL

To counteract black spot it is necessary to strike at the very sources of its further spread, namely, infections on living leaves and infections on dead leaves which have fallen to the ground. Further, only persistent

**Diplocarpon rosae* Wolf

adherence to control procedures is likely to succeed in eradicating the disease.

The first step is the removal and burning of fallen leaves from beneath the plants. This should be repeated from time to time, and will assist in eliminating winter spore infections. If a mulch is used beneath the plants, its character should be considered with this practice in mind. Next, dense plantings should be avoided, as good ventilation will enable the plants to dry rapidly following rains and dews. Plants that are well pruned, properly spaced, and set away from walls or buildings dry quickly, and are less subject to disease. Finally, a suitable fungicide must be applied to the foliage.

The proper selection and application of the fungicide is of first importance. Both the sulfur and the copper-containing fungicides have proved effective in combatting black spot, and either type may be obtained in dust or liquid form. Accessibility, available equipment, ease of preparing and applying, adherence to foliage, severity of the disease, discoloration of the foliage, and effectiveness against other rose diseases are important considerations in the selection of the fungicide. The best all-purpose selection would be a sulfur dust of sufficient fineness to pass readily through a 300-mesh screen. Fine sulfur dust combined with arsenate of lead in the proportion of 90 parts sulfur to 10 parts lead arsenate is a very effective material. Coarser grades of sulfur similar to flowers of sulfur are not suitable. The finely-divided bentonite sulfurs have proved particularly effective, and these may be obtained in either yellow or green colored forms. Copper-lime dust has proved only fair in the control of black spot, and is not an all-purpose material.

The liquids are more difficult to prepare and to apply and in most cases stain the foliage objectionably. However, they adhere to the foliage better than do the dusts and several liquid preparations have given good control. In severe cases where staining of the foliage is of secondary importance, bordeaux mixture would be an excellent material to use. A number of the wettable or colloidal sulfurs have given good control, but likewise discolor the foliage. The addition of ordinary flour to the prepared spray at the rate of two ounces per gallon facilitates adhesion to the foliage, and correspondingly improves the quality of protection. Ammoniacal copper carbonate, although less effective, is one of the better "stainless" materials, and is the choice of many rose growers.

No specific directions may be given as to the time for applying or frequency of application of a fungicide. In general, any time of the day is satisfactory, although because of the possibility of burning, it is a good precaution not to apply liquids of any kind during the middle portions of hot, sunny days. Whether the foliage is dry or moist makes little difference in effectiveness of the material. Since infection becomes active while the foliage is wet, it is particularly important that the fungicide cover the plant, and completely so, during wet weather. Obviously, it should be applied preferably before a rain rather than following. Frequency of applications will vary from 4 or 5 days to 10 days or more apart, depending upon amount of rainfall, prevailing temperatures, adherence of the fungicide, new growth, and other factors. Tender, newly-forming foliage is particularly susceptible, and should be coated promptly with the fungicide. During seasons of the year when the amount of new growth is negligible and rains infrequent, a month or more may elapse between applications.